

Task 2

Neural Network from scratch

The next task is to train a model that can classify the **MNIST Fashion** data set. The MNIST fashion is a collection of 28x28 pixel images of 10 distinct fashion items. The goal is to make a neural network that when given an image can classify it into its relevant category. To make this model a very basic knowledge of neural networks is required. Watch the 3blue1brown playlist in the previous section if you have no idea about what neural network do or how their basic architecture is formed. The math isn't too important, but it's a nice idea to have an intuitive sense of what's going on.

The model should be made with no existing ML libraries, the only libraries allowed are NumPy and Matplotlib. Since this is a large leap I have written a template file which covers most of the basic structure of how the neural network is supposed to be written. The code includes several useful functions that you might have to use while designing the model. The code is heavily commented, so follow along the comments to understand what is going on. The file also has **17 questions of the format [QX]** which you are expected to answer in a separate text file.

The task formally then is to complete the template file, which looks like:

- Write and complete the `forward()` function with a softmax layer at the end which takes in an image and returns the class to which it belongs
- Implement the `cross_entropy_loss()` and `cross_entropy_derivative()` functions to actually return the respective values
- Change the `backprop()` function to use Cross Entropy Loss and make sure the backwards propagation steps uses it's derivative while updating
- Fix the number of `hidden_neurons`, the learning rate and the number of epochs to get the model to above 60% accuracy
- Answer the **17** questions throughout the comments of the template file
- And in the end, obviously to understand what the entire code, both pre-written and written by you, is doing. **This is fairly important as most of your Personal Interview will be based on this**

Template file: [link](#)

Dataset folder: [link](#)

Format of the dataset

The zip file contains a folder with 10 subfolders, each labelled from 0 to 9. Each subfolder is a *class*, which means that all images in a subfolder will be of the same type. The goal is, given an image, give out the number of the class to which it belongs.

Resources

It's a good idea to go through these resources if you don't understand what the code is trying to do

[CS231n Module 1](#) - covers the basic principles involved with making a neural network

[Backprop](#) - helpful medium article exploring backprop

[Math behind matrix derivatives](#) - way more technical, but useful breakdown of the complicated calculus of matrices going on in the world of backprop

[Cross Entropy Loss and Softmax](#) - a helpful article for the task covering how the Cross Entropy Loss function looks like

Further Learning

Completely unnecessary for the task, but a good path forward in terms of coding and learning about Deep Learning

[MakeMore](#) - [Andrej Karpathy](#)

Submission Format

Submit your final `.ipynb` file with the working model (working backprop with the right parameters and function completions) in the following link

Submission link will be shared later